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SIERRA LEONE.

Annual Report

OF THE

Department of Agriculture For the Year 1934.

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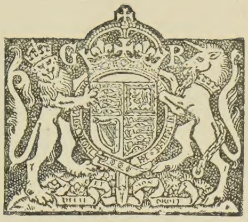

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DEPARTMENT OF AGRICULTURE.

Report for 1934.

PART I—AGRICULTURAL ADMINISTRATION AND PROGRESS.

I have the honour to submit my report for the year 1934.

2. During the past decade the department has experienced a rapid expansion followed by an equally rapid contraction and, as a result, many schemes were started in the former period and jettisoned in the latter. There have also been changes of policy which have hindered progress. It has therefore seemed desirable to include a certain amount of stock-taking in the first part of this report instead of confining it entirely to a review of the past year's work.

3. The last twenty years have seen changes of considerable importance taking place in the agriculture of this country. Owing to the more settled conditions the population has increased considerably and " bush " farming (i.e. shifting cultivation) has increased to such an extent that a great deal of what was once forest is now high bush; high bush has given way to low bush in many parts, and in the more extreme cases grass is creeping in and resulting in a kind of orchard bush. This intensification of " bush " cultivation has lowered the fertility of much of the land, and over much of the country the point has now been reached where no greater intensification of " bush " farming is possible without land going out of cultivation owing to low fertility.

4. This condition was foreseen by the Agricultural Department and some years ago intensive propaganda was undertaken to popularize the growth of swamp-rice in the innumerable inland swamps of the Protectorate. In some parts of the Northern Province the use of swamps was well known, but the knowledge was not general throughout the country nor was the transplanting method well known even in those parts of the Northern Province where swamp-rice was grown. In areas where land was poor through much shifting cultivation, i.e. in the low bush country, there was a great response to swamp-rice propaganda, but in high bush country the response was not so marked.

5. Coupled with propaganda to grow swamp-rice in the swamps during the wet season, the department has endeavoured to encourage the use of swamps during the dry season for sweet potatoes and other food crops. This was not so immediately successful as the rice propaganda, but it is making way steadily, especially in some parts.

6. The growth of swamp cultivation must inevitably lead to an easing of the position with regard to "bush" cultivation, and the department now regards this as one of the most important of its duties. Therefore, although both staff and travelling facilities have been seriously curtailed during the past year, priority has been given to the work in connection with the study and extension of swamp cultivation. Various kinds of rice are distributed in areas where farmers have difficulties owing to the particular nature of their swamps, and great success was obtained last year as a result of continued propaganda with a variety of Indo-China rice in the very deep water swamps of the Bum-Kittom area in the Southern Province. Rice production throughout the Protectorate probably reached a record this year and certain areas which once imported rice are now self-supporting or nearly so. So great was the production of rice in 1934 that hopes are entertained of an export of rice in the very near future and rice was being exported to Gambia early in 1935.

7. The figures for the imports and exports of clean rice for the last five years are:—

Year.	Imports, Tons.	Exports, Tons.	Increase (+) and Decrease (−) of Export over Imports, Tons.
1930	2,612	175	−2,437
1931	457	177	− 280
1932	142	491	+ 349
1933	125	158	+ 33
1934	81	221	+ 140

It is confidently expected that the figures in the last column for 1935 will, owing to the good 1934 crop, exceed 600 tons.

8. In order to stimulate the production of more and better rice, a rice-breeding farm was opened early in 1934 in the Scarcies area. The first report is given by Mr. R. R. Glanville on page 28 *et seq.*, and there is little doubt that a really good start has been made. Later in the year a scheme was drawn up for the development of rice production in the Scarcies area with a view to building up an export industry. The scheme aims at—

(*a*) importing or breeding good types of rice suitable for the varying conditions in the Scarcies area;

(*b*) the multiplication and distribution of suitable varieties;

(*c*) the better harvesting of rice;

(*d*) the milling of rice with a view to export.

The assistance of the Colonial Development Fund was sought and the scheme was sympathetically considered but referred for further information with regard to the type of rice mill required. It was decided to use a three-cone mill capable of

milling either par-boiled or dry rice, and this, although not approved in 1934, was approved early in 1935, and a grant obtained from the Colonial Development Fund to assist the scheme.

9. 1934 marked the peak of the depression (it is hoped) so far as Sierra Leone is concerned. Palm kernels and kolas reached a record low price and the total value of agricultural produce exported dropped to £458,522, the lowest figure since 1905. The figures since 1920 are given below and the seriousness of the position is at once obvious.

Agricultural Exports.

		£
Average	1920–29	1,478,567
	1930	1,038,966
	1931	588,650
	1932	812,709
	1933	588,681
	1934	458,522

This fall in value is due chiefly to the reduced value of the exports of kernels and kolas, and by comparing the figures above with those of kernels and kolas shown below, the part played by these two products is easily seen.

	Kernels.		Kolas.	
Year.	Tons.	£	Tons.	£
1920–1929	58,150	1,024,798	2,929	279,588
1930	56,641	664,591	2,771	186,197
1931	54,462	449,742	1,584	47,847
1932	77,162	687,477	2,085	41,373
1933	64,084	472,824	1,812	43,656
1934	68,655	~~470,780~~ 360,780	1,460	18,304

10. The volume of the export of kernels has been well maintained, the fall in price, being the important factor. It is hoped that the increases in price in early 1935 will be maintained, and the industry recover to a great extent its former value. With respect to kola, however, not only has the price fallen calamitously but the volume of the export has also fallen by 50 per cent. The marked increase in production in Southern Nigeria indicated by the Director of Agriculture, Nigeria, in his last Annual Report, discourages the idea that Nigeria, once our biggest customer, is ever likely to be so good a customer in the future as in the past. Part of our Nigerian market has therefore gone and until sufficient markets can be found to absorb our present production, it cannot be regarded as desirable to encourage the cultivation of kola for export.

11. The production of piassava again reached a new record this year and the quality of the fibre was well maintained. During the year the production of piassava was started in the inland swamps in areas adjacent to the railway line. The fibre on the whole was well prepared but was unfortunately marketed as a substitute for fine Sherbro when in actual fact the type of fibre was more nearly akin to Bassam or fine Gaboon. Mixed reports were received as to the value of this piassava and towards the end of the year enquiries were put in hand to find out what it was worth and under what conditions it could be marketed. The production for the last five years is:—

	Tons.	£
1930	2,417	36,582
1931	3,150	31,846
1932	2,877	23,290
1933	3,499	30,108
1934	3,659	30,390

12. The price of ginger improved during the year and an average amount was exported. The ginger still continues to be of a low grade and comparatively little attention is paid by farmers to its cultivation. A very small quantity of peeled ginger was sold at an appreciable premium, but the amount of the premium is not sufficient to attract producers when the price of scraped ginger is over 2*d.* a lb. and much of the ginger in any case is too small to be peeled. Preliminary experiments in the cultivation of ginger were started in 1933 at Njala and these are being continued.

The exports for the last five years were—

	Tons.	£
1930	1,972	57,228
1931	1,927	32,518
1932	1,382	22,877
1933	1,545	16,543
1934	1,659	23,254

13. Further trial shipments of oranges were made by a local firm with disappointing results, but these consignments arrived home in December by which time oranges from Spain and Palestine were flooding the market. It is essential that oranges from Sierra Leone should be exported during the months of October and November and reach England before December 1st, so that they arrive not only when the market is poorly supplied from other countries but so that they get the value of the bigger preference, 3*s.* 6*d.* a cwt., which exists till December 1st. After December 1st (till 1st April) the duty is 10 per cent. *ad valorem*. The oranges arrived in England in good condition and further trials will be made in 1935.

14. *Beeswax.*—In view of the fact that many chiefdoms in the northern part of the Protectorate have no exportable money crops but many bees, the possibilities of exporting wax were explored. Some 15 cwt. were collected and sent to England as a

trial shipment. The wax was well reported on and was sold at 100*s*. a cwt. while offers for further supplies were received. This product will be studied further in 1935 and the possibilities of assisting producers by the use of better hives will be investigated. Messrs. Barclays Bank assisted the department in the marketing of this wax and we are greatly indebted to them.

15. *Experimental and Extension Work.*—The general work of the department was greatly hampered by a lack of staff and provision for travelling and labour. On January 1st, the Assistant Director was appointed Director and no one appointed in the vacant place, thus further curtailing an already depleted staff. Since 1930 the European staff in the various sections of the department has been reduced from 16 to 9 and the provision under "Other Charges" has been reduced by over 75 per cent. Under these conditions many of the activities of 1930 have had to be either abandoned or curtailed. The position cannot be regarded other than as extremely serious. It is essential to have a sufficient staff to operate efficiently one dry-land experimental station (Njala) with the necessary extension work in the Southern Province; one wet-land experimental rice station (Rokupr) with the necessary extension work in the Scarcies area; while the extension work in the Northern Province (other than in the Scarcies area) can be carried on with the Makeni demonstration farm as its centre. There was not sufficient staff available for this work during the year and the work at Njala and the extension work throughout the Protectorate suffered in consequence. In spite of these difficulties and discouragements the staff worked exceedingly well, and the reports of the various officers given in Part II show what excellent work they were able to accomplish.

16. The effect of the lack of staff was most acutely felt in the Southern Province where the officer-in-charge had to be changed four times in the year to allow of the various leave reliefs. The Agricultural Officer reports—"The district work has had to be still further restricted, for not until the last two months was there an Agricultural Officer available to carry out tours of inspection"; and again with respect to the experimental station—"for another year investigational work, particularly with annual crops, was greatly restricted." The work of the department must be based on sound agricultural experiments and experience gained at our departmental stations and this "greatly restricted" programme at Njala is a bar to agricultural development in the whole Protectorate.

17. At Rokupr (pages 28 to 34) a good start has been made with rice breeding and it is pleasing to be able to record that, thanks to the Colonial Development Fund, this station is assured of existence for the next two years. By that time I have no doubt that the work of the station will so have proved its value that the permanence of a station in the "rice granery" of Sierra Leone will never again be in question.

18. The work at Newton is recorded on pages 26 to 28. Progress has been made but much of the " budding " was ruined by excessive gumming. This has never occurred to anything like the same extent before and may be due in some degree to the early cessations of rain, and the extremely dry conditions immediately following it.

19. The plantation at Masanki is being cared for to some extent by prisoners from the district prison there and there is nothing special to report.

20. The report of the Entomologist (pages 16 to 18) shows a full year's work. Fruit piercing moths were exceedingly numerous and various methods of dealing with them were tried. Locusts again invaded Sierra Leone from February to April, but fortunately the swarms were smaller than in the previous year. On the whole comparatively little damage was done, but this is due chiefly to the fact that during this period we are in the middle of the dry season and there are few crops to attack.

21. The Mycologist was only in the Colony about six months owing to leave, but put in good work as will be seen from his report on mycological work (pages 18 to 22) and his report on the Njala oil-palm plots (pages 24 to 26). Scab of citrus has been eliminated to a great extent and it is hoped by continued efforts to eliminate it completely as its distribution is at present limited. Various fruit rots were investigated and some study made of the use of certain substances in preserving citrus juices.

22. In conclusion, in spite of the many difficulties referred to above, the staff have worked well and maintained their health although none have had any opportunity of taking local leave, which conditions of service normally allow. It is sincerely to be hoped that, with improvements in the financial condition of the Colony, further assistance will be given to the department to enable it to tackle more effectively the development of agriculture within the Colony and Protectorate.

F. J. MARTIN,
Director.

PART II—DETAILS OF ASSISTANCE AND PROGRESS.

NORTHERN PROVINCE.

Mr. R. R. Glanville was in charge throughout the year, unassisted, until Mr. G. M. Roddan was posted to the Northern Province on his return from leave in November. Mr. Roddan took over Provincial headquarters at Makeni and the work in the Bombali, Karene and Koinadugu districts: this arrangement left Mr. Glanville free to concentrate on the rice station at Rokupr and work in the Kambia and Port Loko districts.

Now that the rice station has been established the work in the province has been much increased and requires the constant attention of at least two Agricultural Officers.

The subordinate staff was increased by one instructor, which brought the total number in the province up to nine. The scheme for re-grading which came into force during the year was very welcome: the improved terms of service have definitely increased the efficiency of the instructors.

The Makeni Sub-Station was started at the end of 1933 when the headquarters of the Agricultural Officer was transferred from Makump to Makeni. Very good progress has been made and the station should be a success both as a demonstration farm and as a source of planting material for the surrounding chiefdoms.

The farm has been fenced and the whole area stumped and cleared. An area of about half an acre adjacent to the stream, which bounds the farm on two sides, has been levelled and bunded: the plots, which can be irrigated from a main channel which passes through the centre of the farm, were used for rice in the rainy season and for garden crops in the dry season.

A nursery was established and well stocked with Robusta Coffee and Deli Oil-palm. On the farm small plots were planted with Deli Oil-palm, Citrus, Canary Banana, and smooth Cayenne Pine-apple. Among other annual crops the following were grown successfully—yams, coco-yam, Mayugbe and Two Cent cassavas, large white bean, ragi and sunn hemp: in the wet-land plots, Panianala, Baitel Fakir, and G.E.B. 24 rice did very well and attracted much attention.

Six varieties of yam were grown and gave heavy yields: Jaffna King, which was introduced from Ceylon in 1931, gave the biggest return—

Variety.	Yield per Plant (lb.).	Yield per Acre (lb.).
Jaffna King	10·5	45,927
Mayawsaw White	10·2	44,431
Port-Loko White	7·5	32,597
Kabala	5·8	25,181
Chinese	2·5	22,048

All varieties were planted in ridges 5 feet apart, with a spacing between sets of 1 foot for Chinese and 2 feet for other varieties.

The area under cultivation at Makump Sub-Station was reduced to about three acres: the demonstration plots of Nigerian Oil-palm, Robusta Coffee, and smooth Cayenne Pine-apple were retained, as were also the wet-land plots, nursery and surroundings.

The Kambia Sub-Station was also reduced in extent, only the coffee and palm nurseries being retained, as it was considered that other activities could be carried out more efficiently at Rokupr.

The activities at Port Loko, Batkanu, and Kabala sub-staions were similar to that of previous years: coffee and oil-palm were raised in the nurseries and Canary banana, Yellow and Chinese yams, and Mayugbe and Two-Cent cassavas were grown for demonstration and for supply to farmers.

In Appendix I will be found particulars of Planting Material Distributed. As in previous years the supply available, particularly in the case of yams, fell short of the demand.

The distribution of Planting Material on Loan was continued and over 300 farmers received either rice or yams or both. There was a shortage of seed-rice in the Tambaka, Diang, Mafonda and Kolifa-Mabang chiefdoms and 114 bushels of upland and 66 bushels of wet-land rices were supplied to the Paramount Chiefs for distribution to the most necessitous farmers.

District Work was continued along the lines followed in 1933. Good progress was made but once more it proved impossible, on account of understaffing, to keep as closely in touch with the farmers and with the Instructors' work as one would wish. The number of farmers receiving direct assistance from the department was 819, made up as follows: Bombali 346, Karene 158, Koinadugu 54, Port Loko 127, and Kambia 134.

The interest in Robusta Coffee has been maintained, especially in the Bombali and Port Loko districts, and it is hoped that in few years there will be an appreciable quantity for sale. 152 nurseries were sown, and 134 new plantations, containing 12,407 trees, were made.

48 Nigerian and 7 Deli Oil-palm plots, containing respectively 1,690 and 215 seedlings, were planted. Of those established in previous years many are now bearing. Apart from their direct value to owners these plots are serving as useful demonstrations of the benefits to be derived from correct planting methods.

Of annual crops Wet-land Rice has again been given most attention, with encouraging results.

D.C. rice was supplied to forty-seven farmers, apart from those who benefited by the issue to areas suffering from seed shortage.

In the Scarcies rice area small quantities of seed or seedlings of G.E.B. 24 were given to thirty-four farmers, all of whom had good results; this rice was introduced by the department from India in 1931 and it is now well known although not yet sufficiently plentiful to make an appearance in the open market. In the Bombali District, where it has done particularly well at Makeni and Makump, small quantities were given to sixteen farmers.

The scheme to encourage the development of the deeply flooded areas behind the Scarcies tidal swamps has been continued and small quantities of the Deep-water Rices—Panianala and Baitel Fakir, which were also introduced from India in 1931—were given to thirty-four farmers. In most cases encouraging yields have been obtained.

Yellow and Chinese Yams were distributed in all districts. This crop is one which will repay continued attention; not only on account of its direct value, which is considerable, but because its greater popularization will be a definite step towards the adoption of a more intensive system of native farming.

White and Jaffna yams, which have done particularly well on the sub-stations, are now being multiplied and, together with the Yellow yam, will receive preference in the future. The increase in the cultivation of Yellow yams is very noticeable, particularly in the Bombali District, and can be attributed entirely to the department's efforts during the past few years. Large quantities of good planting material have been distributed, but what is of even more importance is the fact that we have been teaching improved methods of cultivation and propagation, and in connection with the latter we have demonstrated that the whole yam may be cut up and all the parts planted; formerly only the crown was used and consequently there was no increase in the crop from year to year.

Ploughing.—Nine farmers ploughed; this is three less than in 1933 but the total area ploughed was about the same—75 acres approximately. Locusts seriously damaged one farm but all the others were remarkably good. These nine men intend to continue ploughing as they thoroughly realize the benefits to be derived from it; it is hoped that they will form a nucleus for voluntary adoption of ploughing as an aid to bigger and better crops.

With the co-operation of the Political Administration, an attempt was made to encourage the production and marketing of Beeswax. All that could be obtained was purchased at prices ranging from 4*d*. to 6*d*. per lb. according to quality. The total quantity purchased was 1,874 lb., the bulk of which came from the Kambia District where the District Commissioner, Mr. E. F. Sayers, made big efforts to make the scheme a success. Although a larger quantity was hoped for, nevertheless this must be considered an encouraging beginning, and it is expected that larger quantities will be forthcoming in 1935 now that the people realize the value of the wax. The wax, which was clarified before shipment, received a very favourable report on the home market and realized 100*s*. per cwt.

Locusts were present from January until July. Early sown fundi and rice were affected, especially in the river areas of the Bombali and Port Loko districts, and many farms had to be resown. Agricultural Instructors supervised anti-hopper measures in all districts.

The Native Food Production of the province was very satisfactory in all districts and was above average.

The rains were late and below normal, but they were evenly distributed from June onwards. The early-sown grain crops suffered during the drought in May, but the main grain crops as well as ground-nuts and root crops were particularly good and more than compensated for the lower yields of the former.

Rice production was definitely higher than in previous years, the Scarcies crop was particularly good.

R. R. GLANVILLE,
Agricultural Officer, Northern Province.

SOUTHERN PROVINCE.

The substantive officer was on leave from January until May when he took over administrative charge at headquarters until October. During this time the work was in charge of Mr. G. M. Roddan, Agricultural Officer, until May, and of Mr. E. I. Nisbett, Agricultural Officer, until the resumption of duty of the writer at the end of October. Mr. E. Hargreaves, Entomologist, supervised the work of Njala Agricultural Station in addition to his own duties for a period of three weeks between the date of departure of Mr. Roddan and the arrival of Mr. Nisbett.

Weather Conditions were mainly favourable for the principal food and plantation crops. Rainfall was below the average in most districts, and precipitation greater in the early part of the wet season than usual and below normal for the month of September. The rainfall statistics for six recording stations in the province are included in Appendix II.

Prices of Agricultural Produce were generally low. For their chief source of money, palm kernels, farmers were getting as small a return as ninepence a bushel early in the year. The price recovered somewhat with the reduction of the export tax and at the end of the year the outlook was distinctly brighter. Rice, the principal food of the people, was plentiful and its price touched the low level of eighteenpence a bushel in August.

District Work has had to be still further restricted, for not until the last two months was there an Agricultural Officer available to carry out tours of inspection. In the eastern part of the province a sub-station was maintained at Pandobu near Kailahun and a nursery at Kenema. The sub-station at Naiahun was closed. Three Agricultural Instructors were engaged in this area during most of the year, devoting their time mainly to the distribution of planting material, and supervision of coffee nursery work and coffee and cacao farms.

In the western area, apart from a small amount of work in Bo District, Moyamba District received the rest of the attention of the available staff. The sub-station at Sumbuya was closed. In this area work was concentrated on several chiefdoms around Njala, and in the Sembehun-Gbangbama area coffee, wet-land rice and ginger with distribution of planting material receiving most attention. Altogether fourteen instructors (including four temporary instructors) were employed in the province, eight of these on an average on work in the districts and the remainder at Njala Agricultural Station. With the exception of one who had charge of a sub-station, all were based on Njala and sent out to districts for specific work. While in Njala they assist with the normal work of the station and undergo training in various branches of their work.

Work in the Sub-Station at Pandobu was devoted to the growing of food-crops for distribution of planting material to local farmers. Two mosaic-resistant kinds of cassava, cowpea, maize (Aku variety), yams and sword beans were planted. A supply of Robusta coffee seedlings will be available for distribution in 1935. Nigerian oil-palm and Robusta coffee seedlings were grown in the nursery at Kenema.

With regard to annual crops a large Rice crop was harvested in all districts. The area under wet-land rice continues to increase and this receives all possible stimulation from the department. Seed-rice, as with certain other crops, is now generally supplied on a loan system to farmers. The only kind to be distributed was the wet-land D.C. variety.

The distribution of the resistant varieties of Cassava (Mayugbe and Two-Cent) has continued particularly in those localities where mosaic is prevalent. The Kono variety of Ground-nut is gaining in popularity and seed has been distributed. Other food-crops to receive attention, and of which planting material was distributed, included Maize, Yams, Chinese Yams, and Cowpea. As regards Ginger, it seems probable that the previous year's export figures will be exceeded. The season opened in December with the price at $1\frac{3}{4}d.$ per lb. offered for scraped ginger. The price has since risen and railments in the first few months of 1935 have been heavy. There is an increasing demand in the new areas for ginger for planting and a quantity was distributed in railway line areas.

With regard to Plantation Crops the only work of note has been in connection with Coffee. Rather less seed and fewer seedlings have been supplied than in the previous year, not because of any falling off in interest, but it has been considered advisable to restrict planting while the staff is inadequate to look after the crop. A fairly large number of plantations are now bearing and the crop already exceeds local requirement. An appreciable quantity was sold at $4d.$ and $5d.$ per lb. for local consumption while for export $2\frac{1}{2}d.$ per lb. was offered. Cacao

planters have been encouraged and assisted to ferment their crop. The export of 138 tons was higher than in any previous year. The most important work carried out with Oil-palms was the demarcation of plots in Masanki Oil-palm Plantation in connection with the scheme for the settlement of native farmers on the plantation. The production of Piassava is being encouraged in the railway area and satisfactory progress was made in the Kenema and Kailahun districts.

Several swarms of Locusts were reported in the period February–April and outbreaks of hoppers occurred in the Mabang-Bauya and the Sumbuya-Pujehun-Bonthe areas. Hoppers were easily killed off and very little damage was done.

While it was possible to pay only a few visits to schools, a close touch has been kept with them in connection with Nature Teaching and School Gardening. Advice was freely given to teachers, and numerous schools were assisted with supplies of planting material.

Six mission schools are now co-operating with the department in Meteorological work. Recording was on the whole satisfactory.

While it has not been possible, in the shortage of Agricultural Officers, to maintain close touch with all farmers whose names are recorded in the Farmers' Register of the province, all possible steps were taken to keep them interested by visits with advice from Instructors.

J. W. D. FISHER,
Agricultural Officer, Southern Province.

COLONY CIRCLE.

The reporting officer has been in charge throughout the year.

Regarding Cassava, the chief food-crop of the Colony, efforts have been made to instruct farmers in a simple method of control of mosaic disease, namely, the selection of healthy sticks only for use as propagating material, and many are now doing this. A special drive was made in a heavily infected district near to Newton as a result of which the instructors concerned later reported 208 out of 240 farms to be practically free from the disease.

Extension work in connection with Wet-land Rice has been continued and 128 bushels of the D.C. and Fodea varieties were distributed as compared with 88 bushels during 1933. The yields were satisfactory, especially in view of the fact that many of the farmers had had no previous experience with swamp-rice. In addition to returning an amount of seed equal to that loaned,

farmers are expected to reserve enough for their requirements next year, so that such seed as is distributed by the department will be to new applicants only. 107 farms were made in 1933 and 182 in 1934, an increase of 75 during the year.

2,353 suckers of Canary Banana were distributed in the Colony during the year.

Figures showing the number of Citrus Plants distributed from the Fruit Farm are given in Appendix I. The majority of these have been planted in the Colony. Although no scheme for the planting of citrus on a commercial scale has as yet been authorized, efforts have been made, by visiting towns and villages and by talking to the headmen and others, to gauge the willingness of the farmers to grow citrus trees, especially grapefruit. It has been found that although a number of small-holders are willing to plant these on their cassava farms, very few indeed wish to reserve land exclusively for citrus trees. This is quite understandable and it seems that the most hopeful line of advance is to encourage planting on the cassava farms. If this were done the land could not be allowed to go back to bush in order to recover fertility, as is now the custom, and some form of manuring would have to be devised, probably the growing of cover crops after the removal of the cassava.

In connection with Citrus Scab, control work, consisting of the removal of infected leaves and spraying, has continued and the severity of the disease has been very greatly reduced by this treatment.

There has been a very good demand for Coffee this year and Instructors have been kept busy in helping with the preparation and maintenance of seed and nursery beds, planting out in the field and other work in this connection. The methods of cultivation are new to most farmers, but due to the efforts of the Instructors the work has been very successful.

Altogether 2,353 Canary banana suckers were distributed in the Colony during the year. This type is very popular and there is a continuous demand for suckers.

An Agricultural Show was held in Freetown in May and was opened by His Excellency the Governor. The Show was organized by the Committee of the local Agricultural and Commercial Society with assistance by the Agricultural Department. There were classes for fruits, vegetables and other produce. The Show was well attended and the number and quality of the exhibits gave great hopes for the future of this Show, which the Society propose to hold annually.

E. S. GARNER,
Agricultural Officer, Colony.

PRODUCE INSPECTION.

Palm Kernels.—The low prices of the previous year continued to prevail into the early portion of 1934, until in fact Government came to the aid of the industry by reducing the export duty from 30*s.* to 10*s.* per ton, thus allowing dealers to offer an additional 20*s.* per ton to native collectors. This came into effect on April the 10th, at a time when prices had dropped to such a low level that in some parts of the country, beyond the railway terminus the prices paid for kernels were so low that production was discouraged. In many instances petty traders were buying slightly above the ruling price, merely to encourage native buying and thus keep their trade alive. It was a very critical period indeed for all those connected with the industry and there can be little doubt that the intervention of Government at such a time averted hardship to both the native population dependent upon the industry and those dealers with limited capital who otherwise would have been forced to stop trading. From April onwards prices gradually improved, except for a few days at the latter part of June, after which they recovered and continued to improve until the end of the year.

In spite of the crippling effects on trade experienced in the first four months of the year, the total exports reached a figure which, with the exception of those for 1932, constitute a record; they amounted to 68,655 tons: of this quantity 33,925 tons were transported by the railway, the balance being conveyed by river and other forms of transport. Exports from Freetown amounted to 46,539: from Bonthe 21,548; from Sulima 561 and Mano Salija 7 tons. It is interesting to report that the industry in districts supplying the Sulima market has made rapid strides within the past five years, and exports have increased from 64 tons in 1930 to those already quoted for this year, which represents an increase of 205 tons over those of the previous year.

The standard of purity imposed under the Native Produce Ordinance was well maintained throughout the year by means of up-country inspection, and it is pleasing to report that the number of prosecutions for infringements of the Native Produce Ordinance showed a decided decline in comparison with former years.

Palm Oil.—Trading conditions in the palm oil industry are similar to those of the palm kernel industry. Exports amounted to 2,225 tons. Of this quantity 1,763 tons were transported by the railway, these figures representing an increase over those of last year of 606 tons and 401 tons, respectively. There were no infringements of the relative section of the Native Produce Ordinance. The general quality of the oil was good and conformed with the standard of previous years.

Piassava.—Preparation throughout the year has been steadily maintained and resulted in a record export of 3,659 tons, an increase of 160 tons compared with those of last year. Buying

prices throughout the year were good, and from the fact that they continued consistent, successful business has been achieved for all engaged in the industry. A considerable improvement in the quality prepared from the Sulima and Mano Salija areas has been effected with the result that better prices have been in evidence than hitherto in those parts of the country.

Exports from each of the Ports were: Bonthe 747 tons: Sulima 2,481 tons: Mano Salija 327 tons: Freetown 104 tons.

Instructional propaganda continued throughout the year in inland swamps in chiefdoms adjacent to the main railway line. Considerable interest has been shown by the people who have followed out extremely well the methods of preparation shown to them and produce for the market a perfectly clean type of piassava that requires no further picking over before export.

The appearance of this piassava differs from that usually associated with either Sherbro or Sulima types. The fibres are in the main slightly coarser and in colour vary from a dark brown to a blackish brown, pliability is very good and consistent—where correct preparation has been followed out—and it is in every respect, with the exception of colour already described, equal in quality although heavier in character to that recognized by the trade as " Prime Sherbro " quality.

Raffia.—As an export, commercial interest in this product is dead, and only comparatively small quantities were prepared for home use in the native markets.

Ginger.—Exports amounted to 1,659 tons, an increase of 114 tons when compared with figures for last year. Native growers are still very careless in their methods of preparation for sale, in consequence of this, strict vigilance has been necessary by inspection at the ports to ensure that the export standard of purity has been attained before shipment can be effected.

Rice.—Supplies throughout the year have been plentiful and there has been ample for home consumption and export. A steadily increasing trade has been opened up with the Gambia Colony who have absorbed most of the exports during the year. Exports amounted to 221 tons, an increase of 62 tons over the previous year.

Beeswax.—An experimental shipment of appoximately 15 cwt. of beeswax was made during the latter part of the year. Supplies of the crude wax was first purchased from local native sources and then clarified by this department by the use of methods which can quite easily be followed by the natives themselves before offering their wax for sale. The shipment was well received by the buyers at home who expressed their satisfaction of the quality received.

Fruit.—The first commercially controlled shipments of Citrus fruits were made in the last quarter of the year and consisted of 162 cases of oranges and 18 cases of grapefruit. The oranges were bought from local native growers and the grapefruit from the Agricultural Department station at Njala: the washing, grading, colouring and packing were undertaken by the Sierra Leone Fruit Export Company.

Prosecution.—The number of persons reported for infringement of the Native Produce Ordinance amounted to 63: of this, 54 were convicted and 7 discharged, 2 remaining to be dealt with at the end of the year.

Weights and Measures.—The verification of weights and measures was carried out by the Inspector of Plants and Produce during the year and 90 certificates of justness issued.

F. W. B.-ALLINSON,
Inspector of Plants and Produce.

PART III—AGRICULTURAL INVESTIGATION.

ENTOMOLOGICAL WORK.

The following report deals with work under the heading of the different crops with which it was carried out.

Cassava.—Trials were made with an Aleurodid suspected of being a vector of *mosaic disease*, but no symptoms developed. One difficulty is to obtain controlled conditions which are favourable for development of the insects, especially during the drier months of December to May.

Citrus.—Fruit-piercing moths. Achæa catocaloides, Guen. were exceedingly numerous; first arrivals were early April and none were to be seen after June 1st; *Serrodes partita*, F. and *Serrodes trispila*, Mab. were prevalent from mid-March to mid-April, while *Achæa faber*, Holl., *Achæa lienardi*, Boisd., *Achæa Mormoides*, Wlk. and *Othreis fullonica* L. were common from mid-April to early June. It is of interest to note that the November–December generation of *Othreis fullonica* and *Othreis divitiosa*, Wlk., did not develop. Additional species of piercers recorded are:—*Achæa catella*, Guen., *Achæa dasybasis*, Hmps., *Achæa indicabilis*, Wlk., *Anua tirhaca*, Cram., *Sphingomorpha pudens*, Holl., *Sphingomorpha xanthoperus*, Hmps. Further larval hosts found are *Stephania Dinklagei* and *Triclisia patens* for *Othreis fullonica* and *Rhigiocarya racemifera* for *Othreis materna*, L.

Poisoned baits were maintained from mid-March to mid-June; at first, sodium fluoride and sodium fluosilicate in addition to sodium arsenite were tried as poisons, but later the last only was used pending experiment in the laboratory regarding palatability and effects of the three, as it is now obvious that the numbers of moths taken from the bait each day do not necessarily form a

true criterion of relative efficiency. It was found that Demerara sugar was much more attractive than cheaper brown sugar, and of three arsenite formulæ (*a*) sodium arsenite 1 gm.: sugar 75 gm.: water 1,200 cc., (*b*) 2: 150: 1,200 and (*c*) 2: 75: 1,200, (*b*) gave apparently the best result, with (*a*) a close second and (*c*) of little use. In a small laboratory trial with *Othreis fullonica*, moths died within a day of feeding on (*a*), but after more than a day after feeding on (*b*). Further trials will be made when quantities of the different moths are available. Consideration of the diurnal hiding habit of *Achæa catocaloides* gave the idea that some shelter placed over the bait tins may render them more effective, and a certain number with louvred covers were tried; they yielded less than the ordinary tins.

Windfalls due to piercing were very few except during May and June.

Ground-nut.—With regard to *virus diseases*, it was noted that plots lightly shaded were not affected so early or severely as those in the open, this no doubt being an indirect effect of the preference shown by ants attending the aphis for the open; actual transport of aphis by ants, however, has not yet been observed. Spacing experiments from this viewpoint were carried out, but damage to plants by animals rendered them useless.

Of the provisional three varieties of virus disease, only the "rosette" type seriously affects yield; and even in this case, if infection occurs after the plant is about half grown there is apparently little reduction in yield. Time of planting therefore, relative to aphid conditions, may play an important part in the successful cultivation of this crop.

Other points emerging from experiment are:—infected aphids retain power of infection after moulting; nymphs newly born of infected parents, failed to infect healthy plants.

Avocado.—These were seriously attacked by thrips (? sp.) in January, February and March, resulting in some cases in almost total defoliation. Nicotine sulphate used at the rate of 1 part to 800 parts water was effective.

Locusts (*Locusta migratoria*). *Swarms* were most active from February to April, and were of much smaller average size than in previous years; a total of 89 were recorded. The main *hopper* infestation occurred in the western portion of the country, but there were also many outbreaks along the railroad west and south of 12° and 9° respectively (Mabang-Bauya-Makeni), a very marked feature apparently due to the early burning of the vegetation alongside, rendering the areas attractive for oviposition. In the area between Bonthe, Sumbuya and Pujehun occurred numerous hoppers and adults of a bright green colour approaching the "solitary" phase. Parasitism by flies was not so common as in earlier years. Most of the hoppers were killed, and little damage was done.

Zonocerus Variegatus, L.—Oviposition was later than usual, continuing until the end of April, and during this month about 30 per cent. were found to be parasitised by flies; the greatest number of larvæ found in one individual was nine and they may occur in any part of the body, including the head. In many cases all eggs in the ovaries were destroyed. This no doubt accounted for the comparatively few hoppers which hatched out later in the year.

Reference Collection.—Nearly 500 identifications were received from the Imperial Institute of Entomology, of which 16 were new species and 29 new to the British Museum. Included were *Corcyra cephalonica* Staint. attacking pigeon-pea in store; *Leptocorisa apicalis*, West. and *Mirperus torridus*, West., sometimes serious pests on rice ears when in the "milk" stage; *Acrocercops cœrulea*, Meyr., a leaf-miner on beans and cowpea; *Euchrysops malathana*, Boisd. on beans and cowpea; and *Spalgis lemolea*, Druce, a butterfly, the larvæ of which live on a mealybug (*Ferrisia Virgata*, Ckll.) which is sometimes serious on coffee and guava.

Kola.—Treatment with a wash made up of nicotine sulphate one part to water 800 parts effectively dealt with the kola Psyllid (*Mesohomotoma tessmanni*, Aulm.) without injury to the plant.

Rice.—Fumigation trials against pests of stored rice showed that, using carbon bisulphide, exposure for 48 hours at a concentration of 7·5 lb. per 1,000 c. ft. was necessary to be thoroughly effective.

E. HARGREAVES,
Entomologist.

MYCOLOGICAL WORK.

The following report for 1934 is given under the headings of the different crops with which it was carried out.

Banana.—A second record of cigar-end rot of Cavendish bananas was made in the Colony in May. The only fungus associated was *Stachylidium theobromæ*. At Njala, black tip rot associated with *Helminthosporium torulosum* has again occurred sporadically.

The leaf speckle caused by *Rhinotrichum* sp. recorded in the last report has not yet been seen in Freetown, and is apparently not common at Newton.

Citrus.—Scab was not severe this year on the leaves of the grapefruit trees (planted in 1927) at Njala, except on one or two individuals. On the fruit, scab was less than in previous years. It would appear that there is considerable individual variation among this batch of imported trees in susceptibility to scab: and the continued severity of the disease on individual sour orange

and rough lemon seedlings at Newton after long and careful treatment for its control must be considered to be due to the especial susceptibility of these individuals.

Scab appears to have been now almost eliminated from Newton and it is hoped that the process will be completed in 1935. Removal of diseased leaves and (in the case of badly scabbed sour orange and rough lemon seedlings which it was not desirable to uproot completely) cutting off all the leafy part, followed by spraying with bordeaux mixture, has been carried out repeatedly during the last year; individual nursery seedlings which still showed severe scab after several such treatments were uprooted and burnt.

An experiment was set up at Newton and Njala on the lines of that carried out by Professor H. R. Briton-Jones in Trinidad (*Tropical Agriculture* X, 1933). Sour orange seedlings were used, half the beds being shaded and half unshaded. The beneficial effect of the (palm leaf) shade at Newton was very evident, for whereas every one of the 401 seedlings in the open were badly scabbed, only 11 per cent. of the 463 in the shade showed scab on their leaves. At Njala, where the source of scab spores is small, results were not conclusive, though in some beds there was distinct indication that scab infection was greater on unshaded seedlings.

Early in July, Psorosis appeared on some of the late Valencia and Washington navel oranges (imported in 1925 from South Africa) at Njala. Lesions on the branches were at first treated by scraping, but fresh lesions broke out later on the treated trees, and as the Washington navels bear fruit of inferior quality, and in view of the suspected virus nature of the disease, all infected plants have now been uprooted and burnt. Fruit rots in the Njala store were mainly caused by *Diplodia natalensis* (stem-end rot), *Penicillium digitatum* being also common. On old shrivelled grapefruit kept long in the store, a dry rot was common at the bottom end, caused by an *Aspergillus* of *A. wentii* Wehm. series which spored abundantly on the surface of the fruit: this fungus was again common on shrivelled grapefruit in store in early 1935. *Hypomyces ipomoeæ* (Hals.) Wr. was isolated from a bruise rot of grapefruit and *Phytophthora parasitica* Dastur section *macrospora* Ashby from a rot of "sweet Lime."

Trials with different preservatives for citrus fruit juice ("pulp") were carried out in corked flasks in the laboratory. It was found that neither sodium benzoate nor sodium bisulphite were useful preservatives for grapefruit, orange or lemon juice. Discoloration occurred with both these preservatives and increased with higher concentrations of them. While sodium bisulphite apparently checked bacterial growth it allowed mould fungi and yeasts to grow on the juice at concentrations of the preservatives up to and including 5·16 gr. per gallon (350 parts SO_2 per million). Sodium benzoate as a rule checked the growth of fungi,

though *Aspergillus* and yeasts appeared in some trials with low concentrations of the preservative; and while at 3·22 gr. per gallon and over growth of organisms were generally inhibited, 3·22 gr. per gallon in orange juice allowed some bacteria to grow.

Potassium metabisulphite at 5·52 gr. per gallon (350 parts of SO_2 per million) was an effective preservative for grapefruit, lemon and orange juice for generally more than a month in the first two cases, and in the case of orange at least sometimes for a month or more. In some flasks with this concentration of preservative, grapefruit juice remained good in taste and colour after $2\frac{1}{2}$ months. At lower concentrations, slight discoloration appeared sooner or later, and *Aspergillus* grew on the juice.

In these trials no special precautions were taken to guard against entry of fungus spores, but it is evident that more than sufficient fungus spores already exist in the air for contamination of any juice exposed while being extracted. Untreated juice invariably fermented (a *Mycotorula* was the most constant fungus) or went " mouldy " within one or two days. The fungi commonly encountered were only two: *Aspergillus niger* and *Mycotorula* sp., and only the *Aspergillus* can apparently stand relatively high concentrations of SO_2. Other fungi recorded rarely on the juice were: *Trichoderma köningi*, *Pencillium luteum* " group " *Pæcilomyces varioti* " series " and another species of *Pæcilomyces*.

Cowpea and Bean.—*Macrophomina phaseoli* was observed at Njala this year occasionally on the base of old stems of cowpea (*Vigna*) and French bean, and on old stems of French bean at Hill Station. In no case was an attack seen on a young plant. In culture, the spores gave rise to the typical *Rhizoctonia bataticola* stage.

Mosaic was very common on cowpea plants at Njala in 1934: this is the first definite record of the disease in this country.

Garden Egg.—Ripe fruit rots associated with *Glæosporium melongenæ* Sacc. and in one case with *Colletotrichum* (*Vermicularia*) *capsici* have been recorded at Njala: the rot only occurs on fruit kept for seed, and as the seed is rarely affected the fungi are of no importance. A case of a mummified fruit at Njala was associated with *Phyllosticta hortorum* Speg.

Leaves of garden egg and also of the commonly cultivated *Solanum duplosinuatum* were frequently seen during the dry season near Njala attacked by a white " mildew," which proved to be a species of *Piricularia*.

Oil-palm.—Rotting of the ripe fruit in bunches was common, especially on the Deli palms, in the oil-palm plots at Njala in March and to a certain extent in April and May. The fungus commonly found on the shrivelled fruit was a *Colletotrichum* with cinnamon-brown spore masses: a *Fusarium* (*Hypomyces ipomœæ*) and *Botryodiplodia theobromæ* were recorded occasionally and appeared to be secondary. On the rotted fruit bunches on the

tree, *Coprinus atramentarius* frequently appeared. The disease has occurred regularly in these months each year, but the Deli palms, which have only just started to fruit, appear to be much more susceptible than the other varieties at Njala.

Papaw. The chief cause of rot of ripe fruit is *Glomerella cingulata:* other fungi which sometime appear to cause fruit rot (though *Glomerella* is always to be found on another part of the same fruit) are *Colletotrichum* (*Vermicularia*) *capsici*, *Botryodiplodia theobromæ*, *Helminthosporium gigasporum* and *Fusarium* sp. A species of *Phoma* was associated with a case of stylar end rot at Njala.

Colletotrichum glœosporioides has been observed during the dry season especially, causing a leaf tip blight of a small ornamental Pandanus and several cultivated Dracaenas (*D. smithii*, *D. ovata* and *Cordyline terminalis*). It has also occurred on leaves of several cultivated orchids.

Miscellaneous Diseases recorded include a second suspected virus disease of *Sida carpinifolia* in which there is slight mosaic on the younger leaves, while the older leaves are deep green and curled upwards at the edge and their veins are much and irregularly thickened on the lower surface; a suspected virus disease of *Crotalaria retusa* in which the upper internodes are somewhat shortened and the upper leaves show a pale yellow-green mosaic; and *Helminthosporium oryzæ* on glumes of wild *Oryza glaberrima*, on which host it is apparently rare.

The following identifications have been received from the Imperial Mycological Institute: *Cercospora canescens* Ell. & Mart., on *Crotalaria juncea* and on tomato; *Cercospora canavaliæ* Syd., on *Canavalia ensiformis: Cercospora fusimaculans* Atk., on *Panicum maximum; Cercospora ipomœæ* Wint. on *Ipomoea purpurea; Helminthosporium turcicum* Passer, on *Sorghum margaritiferum. Alternaria circinans* (B & C.) Bolle, on cabbage and kohl rabi; *Ragnhildiana manihotis* Stev. & Solh., on cassava; *Exosporium tamarindi* H. Syd., on old leaves of *Tamarindus indica; Fusarium oxysporum* Schlecht., in vascular wilt of *Ageratum conyzoides; Fusarium Sambucinum* Fuck. forma and *Botryodiplodia theobromæ* Pat., on fruit of coconut; *Epidochium* sp. on leaves of *Rinorea liberica; Dinemasporium graminum* Lev. forma *bambusæ* Roll., on old leaves of *Vetiveria nigritana; Tryblidiella rufula* (Spreng.) Sacc. var. *microspora* Ell. & Ev. and *Eutypella citricola* Syd., on dead twigs of lime. The following entomogenous fungi: *Beauveria densa* (Link.) Vuill on the kola weevil (*Paremydica insperata*); *Gibellula aranearum* (Schw.) Syd., on a homopterous bug on *Merremia dissecta; Aschersonia marginata* Ell & Ev. on *Saissetia nigra* on *Plumeria; Hirsutella citriformis* Speare, on a reduviid bug. The following saprophytes and culture weeds; *Coprinus plicatilis* (Curt) Fr. and *Psilocybe fœnicesii* (Pers.) Fr., on garden soil; *Aspergillus versicolor* (Vuill.) Tirabosch; *Penicillium citrinum* Sopp.; *Syncephalastrum cinereum* Bain.; *Papularia arundinis* (Cda.) Fr.

Some 120 specimens of fungi and 125 specimens of flowering plants were despatched during the year to the Imperial Mycological Institute and to the Royal Botanic Gardens, Kew, respectively, duplicates being placed in the HERBARIUM.

A Preliminary List of Fungi and Plant Diseases in Sierra Leone and a List of Fungi recorded in Sierra Leone have been prepared for publication.

F. C. DEIGHTON,
Mycologist.

NJALA AGRICULTURAL STATION.

The following officers were in charge during the period shown:—

Mr. J. W. D. Fisher, Agricultural Officer, January 1 to 5.

Mr. G. M. Roddan, Agricultural Officer, January 6 to May 11.

Mr. E. Hargreaves, Entomologist, May 12 to 30.

Mr. E. I. Nisbett, Agricultural Officer, May 31 to October 28.

Mr. J. W. D. Fisher, Agricultural Officer, October 29 to December 31.

For another year investigational work, particularly with annual crops, was greatly restricted. About fifty acres of the recently acquired land at New Njala was surveyed and marked off in plots of an acre each. In exchange for this the part of the station formerly known as the North Farm, Old Njala, was handed back to the native land-owners. About six acres were cleared of light secondary bush, stumped and brought under cultivation.

With regard to ANNUAL CROPS, two acres were planted with CASSAVA to obtain yield and maturation data for five of the commoner kinds and the trial is still in progress. Harvests are made at three monthly intervals from six to fifteen months. The varieties under trial are Mayugbe, Two-Cent, Kande, Kono and White. An acre was planted for a trial under the Mycologist's supervision, in which healthy and mosaic plants of several varieties were compared from the point of view of growth, yield, and yield of starch.

GROUND-NUTS were planted on one acre to test the relative merits, including resistance or otherwise to mosaic disease, of the three varieties—Philippine White, Kono and local. The respective growth-periods of these varieties is Kono 18 weeks, Philippine White 24 weeks and the local variety 30 weeks. The results showed the Kono variety to be superior from point of view of yield with the local variety second and the Philippine White variety last. Observations on mosaic showed that the Kono variety was the least affected while the Philippine White does not here seem to have a high degree of resistance.

Ginger was grown on one acre to test different methods of cultivation, but owing to abnormal weather conditions no reliable data were obtained.

Yams were grown for distribution of seed to farmers. The yield of yellow yam was equivalent to 14,396 lb. per acre, and of Chinese yam 7,075 lb. per acre.

Other crops grown for feeding to stock included Maize, Guinea-corn, Sword Bean and Cowpea. Guinea-corn was severely attacked by thrips and much of the crop was also damaged by a *Fusarium* which gave rise to mouldy inflorescences. Mosaic was very prevalent on cowpeas.

Five varieties of Upland Rice were grown for observation purposes.

Plantation Crops.—The Citrus varieties again produced good crops. Over 15,000 fruits were harvested from the grapefruit trees. The quality of the Washington Navel oranges is still poor and it is proposed to cut out this variety. Spraying trials for insect and citrus scab control were continued in conjunction with the work of the Entomologist and Mycologist. Psorosis disease appeared on Late Valencia and Washington Navel oranges in July. Affected trees were at first treated and later cut out as the disease is believed to belong to the virus class. Citrus nursery work included budding of sour orange stocks with buds from Marsh grapefruit tree No. 16 and Lue Gin Gong orange tree No. 3; and two trials in conjunction with the work of the Mycologist. The first of these was designed to show the effect of shade on citrus scab incidence on seedling sour orange. The growth of the plants was so vigorous as to interfere in most sections with the shading arrangements, but it would appear that there is a reduction in scab infection of seedlings when grown in shade as compared with those grown in the open. The other was to show the effect of different treatments of grapefruit and lemons prior to despatch from nursery where there was a heavy scab infection. Simple defoliation with pruning seemed to be as effective as any fungicidal treatment.

Trial shipment of grapefruits and oranges to England were carried out, while the bulk of the crop was disposed of in the local market.

Records of "windfall" and scabbed fruits were continued in conjunction with the work of the Entomologist and Mycologist.

With regard to Coffee small plots of excelsa and robusta varieties have been made under the natural shade of thinned bush at New Njala. A further two acres were cleared, stumped and holed for planting in 1935 and shade trees of the following species were planted:—*Albizzia zygia*, *Leucæna glauca*, *Cassia siamea* and *Erythrina glauca*.

Work on Kola was continued on the same lines as in past years. An acre was cleared and stumped in the new experimental area at New Njala for planting in 1936.

Oil-palms form the subject of a separate report. Work was continued as in past years and the plots were all maintained in satisfactory condition.

A start was made on work with Poultry with a view to the improvement of native fowls. Rhode Island Red, Brown Leghorn and White Leghorn breeds are undergoing trial.

Vegetable Gardening has been added to the activities of the station with the object of training the junior native staff in gardening practice and for distribution of native and imported vegetable seeds.

Considerable quantities of planting material of economic and ornamental plants were distributed as usual to native farmers and others. Particulars of these are to be found in Appendix I.

J. W. D. FISHER,
Agricultural Officer, Southern Province.

NJALA OIL-PALM PLOTS.

Cultural operations were confined, in previous years, to cutlassing the grass and removing old leaves to heaps between the rows. Part of the Deli plot has a dense cover of *Pueraria*. Ring-weeding was continued for the convenience of harvesting and recording.

The Nigerian Palms are in their fourteenth year after planting. One new tree came into bearing for the first time in November, 1934, and bore fruit of the " tugbui " (*pisifera*) type. making the total of trees of this type in the plot now 7. (The yield of these trees is for convenience included with the thin-shelled (A) group.) This new bearing tree has given regularly in the past a large number of female inflorescences all of which have aborted as did the inflorescences successive to the one November fruit-bearing head. Otherwise, the kinds and numbers of trees in the plot are the same as given in the 1931 report. There are still nine trees which have not yet fruited.

Three trees of the A (thin-shelled) and one of the B (thick-shelled) group did not bear fruit in 1934, namely A 2/12, 7/11 and 23/12; and B 5/11. Of these, 2/12 has not borne fruit since 1928, 7/11 not since 1931, while 23/12 did not fruit in 1933 and 5/11 did not fruit in 1931. All four trees are extremely poor yielders.

The figures for the Yield of the different groups, the yield of the whole plantation, and of averages, etc., are given in Appendix IV, A–G. The yield for the year was 165 kg. less than for last year. Since 1930, the annual yield has remained more or less constant. The number of fruit-bearing heads harvested was 43 less than in 1933.

In regard to Flowering, the number of female inflorescences at anthesis recorded during the year was 643 less than in 1933 and 338 less than in 1932. There were again two waves of flowering with crests about April and October.

There was a still further decrease in the number of male inflorescences flowering, the number recorded during the year being 304 less than in 1933 and 433 less than in 1932. The number of male inflorescences flowering during the year was over three times the number of females. June, as usual, was the one month in which there were fewer male than female inflorescences at anthesis. This was also the month of minimum production of male flowers, the maximum being in November.

The Average Weight of Fruit per Head for thick-shelled was 1·3 kg. more than for thin-shelled, the actual figures being 5·8 and 4·5 kg., respectively: the average weight of head was 8·7 and 7·5 kg., respectively. These average figures are somewhat smaller than in 1933 though higher than in 1932. The average output of fruit of B palms was rather over 1·3 times that of A; this is less than in previous years. As in previous years the proportion of fruit per head for the thin-shelled was considerably less than for the thick-shelled.

The highest yielding A palm in 1934 gave 67 kg. of fruit as against 83 kg. for the highest yielding B. Again there were a larger proportion of higher yielding B than A palms although, as before, the majority of palms of both groups gave yields for the year of between 10 and 30 kg. of fruit. In regard to total yield of fruit for individual palms for the nine years 1926–34, the two highest yielding A palms have given 324 kg. of fruit each, while the two highest yielding B palms have given 388 and 384 kg. of fruit, respectively.

The figures for the yield of the Native Oil-Palms are given in Appendix IV, H–K. The yield of the Kawei and Henoi palms is 547 and 88 kg. less, respectively, than in 1933. The Kpolei yield was 230 kg. more than in 1932. The average output of fruit per tree from Kawei and Henoi plots is much less than that of the Nigerian palms at the same age, but the yield of the Kpolei palms is about the same as Nigerian at the same age. The highest yielding palms of the three types in 1934 were: Henoi, 34 kg. (most palms gave under 20 kg.); Kawei, 45·5 kg. (most palms gave between 5 and 25 kg.); Kpolei, 53·5 kg. (most palms gave between 15 and 25 kg.).

The figures for the yield of the Angola Palms are given in Appendix IV L. The yield was 90 kg. less than in 1933, and the six palms gave the following yields of fruit, respectively:—

Palms bearing thick-shelled fruit, 43 and 34 kg.;

Palms bearing thin-shelled fruit, 39, 26, 26 and 22 kg.

Figures for Average Weight of Head and Average Weight of Fruit per Head for the Kawei, Henoi, Kpolei and Angola palms are given in Appendix IV M. As before, the Kawei and Henoi heads were very small and have shown little increase in size since last year, whereas the Kpolei and Angola heads are considerably bigger this year than in 1933.

The figure for the yield of the Deli Palms are given Appendix IV N. The 1934 heads were of average weight—2·7 kg., containing 1·7 kg. of fruit. The highest yielding palm gave 29 kg. in 1934. These palms came from Sumatran seed from selected trees, sown late November, 1927, and planted out in June, 1930.

F. C. DEIGHTON,
Mycologist.

NEWTON EXPERIMENTAL FRUIT FARM.

The reporting officer has been in charge throughout the year.

In the Citrus Experiments many stocks required rebudding, especially with Marsh grapefruit which "takes" less well than most varieties. By the end of the year very nearly all of the oranges, grapefruits and lemons in the Variety Trials had been successfully budded. Of the mandarins and tangerines, in spite of repeated attempts, only a small proportion of the buds "took." In the Rootstock Trials very nearly all of the Valencia orange and Genoa lemon have taken but only a small percentage of the California Marsh grapefruit. In the Fertilizer Trials the budding of Marsh grapefruit was more successful, as there was a supply of budwood from other sources to draw upon, and a large proportion of the bud shoots are now growing.

A number of factors have militated against good success in this work, such as gumming at the incisions after budding; "scab" disease, which has necessitated defoliating and spraying several times; trunk rots; grasshoppers and crickets, all of which have caused losses or damage to the young plants.

Efforts have been made to establish Cover Crops in the area of the Citrus Experiments. The existing cover, consisting of a small quantity of grass together with a little Calapogonium remaining after the tree stations had been mulched, was ploughed in. In addition to this, grass-manure was dug in by hand over part of the area. Pueraria was seeded and both this and the Calapogonium made fair growth in the parts which had been manured but on other parts the growth was very poor, a result which clearly showed the low fertility of this sandy soil.

The Marcarty Grapefruit trees, planted in 1929, were sprayed several times according to the recommendations of the Entomologist and Mycologist. This diminished very greatly the amount of blemish on the fruit due to "scab," mites, scale and other causes.

An experiment in Height of Budding has been started, to determine to what extent infection trunk rots may be lessened by high budding.

In the Citrus Nursery the great majority of the older budded plants have been sold or used as guard rows in the Fertilizer Trials and in additional 3,000 sour orange seedlings have been grown for budding.

Some of these sour orange seedlings were used for a Shading Experiment during the rainy season to determine the effect of shading on the incidence of "scab." The results were:—

	Scabbed, Number.	Not Scabbed, Number.
Shaded	51	412
Unshaded	401	Nil

Although shading was thus shown to be a useful method of control for scab, it was also found, with other seedlings, that spraying at fortnightly intervals with a copper sulphate spray was quite equally effective in preventing infection on young seedlings. No scab was found where this was done, even though these seedlings were grown without shade in the middle of a heavily infected nursery. On the other hand such spraying appears to be of very little benefit once the plants have become severely infected.

In the Canary Banana Experiment which was started in 1931, the results for 1932 and 1933 showed that the application of nitrogen, phosphorus and potash in inorganic form gave great increase in yield over the control plots, and that irrigation during the dry season also brought about a marked increase in yield. But the results also showed very clearly that fertility could not be maintained on this poor soil by the use of concentrated fertilizers only, even though these had been supplemented by mulching with a cover crop grown *in situ*. With bananas planted at intervals of eight feet it does not seem possible to obtain sufficient bulk of organic material *in situ*. By the end of 1932 all plots had become so poor that it was useless to proceed with the experiment in its original form. Accordingly, during 1934, all plots have been fertilized, irrigated and twice mulched with cut grass obtained from adjacent land with a view to bring the land into good heart again. The mulch was dug in after becoming rotten. A general improvement in growth has resulted, especially on the plots which were previously most backward, and by the end of the year these plots were in a fair way to catch up with those which had previously received preferential treatment. A wind-break has been planted around this area and between the plots and it is expected that this will be of a considerable benefit.

Two Other Banana Experiments are also in progress. In the first of these, a small irrigated area which was described in the Report for 1933, the plants did well until October when they began to be affected by a disease of the stem not yet diagnosed and also by the borer *Cosmopolites soridus*, Germ.

The second experiment was started this year in a small swampy valley. The top-soil was taken from strips ten feet wide and to a depth of about nine inches and thrown up into adjacent strips of the same width, thus making well drained beds. Large amounts of organic matter were incorporated with the soil in the upper level of the beds and the suckers were planted at intervals of ten feet. This is the system followed in swampy land in French Guinea and it is evidently a good one in such situations, since the suckers planted in these beds have done remarkably well.

Regarding Pine-apples it has been found, as with the bananas, that they do well only if supplied with large amounts of manure and that irrigation during the dry season is also very beneficial In the case of the "native" Red Spanish variety the type of crown is most variable; some are multiple and some are too large, in proportion to the size of the fruit, to be suitable for packing. Suckers for propagation have only been taken from plants bearing fruits of good size with small, single crowns and it is hoped by this selection to evolve a strain having these characteristics. Towards the end of the year (December) the various types of suckers were planted separately and dated to ascertain the length of time required for each type to come to fruition. One new variety, the Baronne de Rothschild, has been obtained from French Guinea and the suckers have made good growth.

Seed of *robusta* and *stenophylla* Coffee was again planted for distribution in the Colony during 1935.

The following varieties of Cassava have also been planted for distribution and have been kept free from mosaic disease with a view to supplying farmers with healthy propagating materials:—Asia Minor, Cotton, Cotton Tree, Kanda, Mayugbe, Shenge, Two-cent, White Leaf.

Meteorological Records have been kept throughout the year.

E. S. GARNER,
Agricultural Officer.

ROKUPR EXPERIMENTAL RICE STATION.

The opening, long contemplated, of this station took place early in the year. Mr. R. R. Glanville was in charge throughout the year. The station, which is well situated on the left bank of the Great Scarcies at Rokupr which is about 20 miles from the river mouth, comprises some 32 acres, of which 15½ are tidal swamp, 3 are low-lying alluvial non-tidal land suitable for nurseries, and 13½ are upland with gravel soil.

A dwelling-house for the Agricultural Officer and a building to serve as office and store were erected. Sun-dried mud blocks were used for the walls; the roof of the dwelling-house is thatch and that of the other building is corrugated iron. Other major preliminaries were the stumping and clearing of the farm and nursery, and the construction of bunds and channels on the farm. In addition, a combined drying and threshing ground was made, two wells were dug, and the residential area was brushed and cleared of excess vegetation.

The Purpose of the station is primarily to lay the foundations for an export trade in rice by providing seed of the requisite quality and by evolving and teaching methods of farming and marketing which will maintain the quality of the improved rices as well as lead to increased production.

The main features of the Immediate Programme of work are:—

A. The improvement by Pure Line Selection of the best established rices with a view to increase and distribution in co-operation with farmers.

B. The trial, study, and multiplication of Introduced Varieties with a view to distribution if better than the local varieties.

C. Character Studies of important established rices.

D. Cultural Experiments: Nursery and farm management, including economic sowing and planting rates, and the value of digging, manuring and puddling. The possibility of making wet nurseries in the tidal lands will be investigated. In addition, the existing methods of harvesting, storing, and preparation for the market will be studied.

On account of the heavy programme of work entailed by the preliminary lay out of the station it was not possible in 1934 to do more than make a commencement with A and B.

As an experimental rice station Rokupr is probably unique. As a rule rice stations have controlled irrigation for both nursery and farm and this naturally facilitates ease and accuracy in experimental work; but at Rokupr the nursery is entirely dependent on direct rainfall, and the farm is watered by the tidal overflow from the river. This being the case, it will not be out of place to describe briefly the layout of the nursery and farm and record some of the difficulties encountered during the course of the year.

The Nursery area is three acres in extent which is more than sufficient to supply the farm of $15\frac{1}{2}$ acres. It adjoins the farm and is just above high tide mark. The soil varies from light to medium and, except in a few places, is free from gravel. The portion nearest the farm was previously under tall grasses and raphia palms, and the other part carried high bush and oil-palms. The

whole area was cleared, stumped and levelled as far as possible, although some of the plots adjoining the upland are still rather too sloping. During heavy rains there is a big flow of surface water from the upland which bounds the nurseries on three sides, and to prevent damage from this source it was necessary to dig large open drains around the nursery area on the three sides mentioned.

Sowing began in June and continued until August. A seed rate of 400 lb. per acre was used; this is less than that used by the local farmers, but even so it proved to be on the heavy side as it led to slow growth and small plants, and in future a lower rate will be used. In preparing the nurseries the soil was twice hoed to a depth of about seven inches, and then shallow-hoed until a fine tilth was obtained.

The seed was sown broadcast and covered in the native manner by using a small-bladed hoe. This method proved quite satisfactory. No fertiliser of any kind was used but with continued cultivation an application of organic matter and ashes will be required annually. The only serious trouble encountered in the nursery stage was that arising from damage by heavy rain after sowing and before the rice had become established. Heavy rain after sowing is capable of causing considerable surface wash and there is a real danger not only of seed being washed away but even carried on to another plot, and this of course is a serious matter when different strains of rice are concerned. To prevent mixing from this source a small open drain was made round each seed bed: this proved quite effective but it did not prevent the loss of seed. This loss of seed would be serious in the case of single plant lots, but it is hoped to prevent it by well compacting the soil after sowing and by covering the seed bed with a layer of dry grass until the seedlings have become rooted.

The wetland Farm consists of 15½ acres of tidal swamp and is in the form of a rectangle of which the river constitutes one of the short sides. The depth and duration of flooding depends on the nature of the tide and the amount of flood water in the river. The water always recedes from the farm when the tide ebbs. Normally all but the part of the farm next the nursery area is flooded to some extent for about an hour at each high tide, but at the period of fortnightly high tides the whole farm is flooded and the duration of flooding in the lower blocks is about two hours. In September when the river was in full flood the period of recession from the farm was often for a few hours only. The depth of flooding rarely exceeded 18″ even on the lowest part of the farm.

The farm has been divided into 27 half-acre square blocks, and in addition a strip of about 2 acres adjoining the river has been left as a single block—No. 28. Each block is surrrounded by a bund, the object of which is threefold: to form a permanent demarcation, to afford easy access to all parts of the farm, and to test the possibility of water-control by retaining or excluding the

tidal flood water as desired. Two methods of bunding have been used: in one the blocks are divided by a channel with a bund on either side, and in the other the channel has been omitted. The system is such, however, that each block has channels on at least two sides and so independent water-control is possible in every block.

At present the bunds are only about 1′ high and until they have been heightened complete water-control will not be possible, as at high tides the depth of water is such that it flows over the tops of the bunds in the lower part of the farm.

Although the area had been used almost continuously for rice for the past forty years it had been badly farmed. There were extensive patches of land abandoned on account of weeds—wild rice and sedges—and in addition many swamp trees and bushes were still standing. All those had to be removed and the ground levelled. Before planting, the blocks, with a few exceptions, were deep-hoed twice and then levelled and puddled when in a semi-flooded condition.

The actual planting, harvesting and threshing presented no difficulty, and the labourers proved to be hard working and reasonably accurate and reliable when properly supervised. The comparatively heavy flooding in September was troublesome; it caused some damage to the bunds, it frequently held up planting operations and, in addition, it made it necessary to keep careful watch for sticks and weeds which were carried on to the farm at high tide. The weeds had been thrown into the river further up or down where farms are being cleared and often formed large masses which would have caused serious damage to the growing rice if not cleared before the recession of the tide.

Pests and Diseases were not as troublesome as expected. On account of the nearness of suitable upland areas it was necessary, especially when the rice was in the milk stage, to keep a strict watch for monkeys and birds. Crabs were very plentiful and did considerable damage to the bunds. In addition some small patches of rice near the bunds were disturbed by crabs burrowing underneath; and in a few instances plants were actually cut down. In ordinary farming, damage caused by crabs is not a serious matter but it might prove otherwise in the case of comparative experiments, and this being so it may be necessary to resort to trapping and collection by hand although it is thought that it will be sufficient precaution if each experimental plot is protected by a wide border of guard plants next the bunds. No appreciable damage was caused by insects. The only disease of importance was *Helminthosporium* and it was present to a serious extent on only one plot—a small plot of the local Kalimodu.

Nine blocks were submitted to Uniformity Tests to determine the extent of soil heterogeneity. Each block was planted with a uniform spacing of 1 foot with three seedlings to each stand. Each block was sub-divided into 36 plots, each $23' \times 23'$, the rice from which was harvested, and weighed separately. The Standard Deviation, calculated from the figures thus obtained, varied between 1·72 and 6·01.

To ensure even spacing when planting, each plot was divided with ropes into strips five feet wide. Two men worked side by side in each strip. They were provided with two narrow flat boards 10 feet long and marked in feet and a bamboo pole 5 feet long, also marked in feet. Planting was commenced at one end of a strip, a ten-foot board being carefully placed under each rope and the five-foot pole placed across the strip. The planters walked backwards as they worked their way down the strip. All planting was done with the hand as the local transplanting tool is not so suitable when very accurate work is required. At the commencement the possibility of marking the side ropes at 1′ intervals was tried, but shrinking and stretching made this method impractical and the 10′ boards were then substituted.

A commencement was made with the Pure Line Selection of the most popular local rices: D.C., D.C. pa lil, Fodea, Toma and Bolo. Samples of each of these varieties had been obtained from farmers throughout the rice area. A bulk sample was then sown and the seedlings planted out singly with a spacing of 6 inches. When ripe, 100 plants were selected in the field. In selecting plants particular attention was paid to the following points: duration, height, freedom from disease, absence of awns, good tillering and even heading. Except in the case of Toma all plants with grains having red pericarp were discarded at sight. After drying, the selections were examined in the laboratory and any with grain of an undesirable type as regards purity or yield (determined by weighing) were discarded. The following number of selections have been retained for trial as families in 1935: D.C., 50; D.C. pa lil, 60; Fodea, 45; Bolo, 49; Toma, 23. These varieties are all good rices although at present much mixed, genetically as well as mechanically. However, there should be little difficulty in isolating high-yielding pure strains of each. I consider D.C. pa lil to be the most promising as a possible export variety. Other popular local varieties which were collected and grown for future study, and selection if desirable, were India, Lal, Kindi, Yarat, Bathurst, Bis, Kanlu and Kalimodu.

Of the Introduced Rices grown for the first time, the deep-water variety Kavunginpoothala from Madras, and No. 79, Blue Stick and Lead rice from British Guiana, were particularly promising and will probably prove to be valuable acquisitions. Other varieties grown for the first time were Jeerasalæ, Maskathi and Thayalakkaman from Madras, and Ramcajara, Garrikas-sanavari and Kalyaman from British Guinea. All these are

fairly promising but it is unlikely that they will merit retention. Only small quantities of all these varieties were received and no complete test was possible. Sufficient seed is however available now and comparative trials will be carried out in 1935.

In addition the following rices, introduced in 1931 from Madras, were grown: G.E.B. 24, Co 5, Co 7, Bali, Jeeragasamba, Adt. 3, Kar, Baitel Fakir, and Panianala. G.E.B. 24 is an excellent variety which has done very well, and Co 7 was little behind in quality and performance. Bali, a salt resisting variety, grew well and sufficient seed is now available for a test in the saline areas. Kar, Baitel Fakir and Panianala are deep-water varieties. Kar need not be retained as it shatters easily, but Baitel Fakir and Panianala are heavy croppers although rather coarse in quality. They are already established to some extent in the deeply flooded parts of the Scarcies Delta and are being grown at Rokupr for seed production only. Adt. 3, a three-month variety, was disappointing, but it will be given a further trial with a very brief nursery period.

The following is a list to show the varieties grown in 1934 and the quantity of seed of each now available.

Variety.	Origin.	Seed in Lb.
D.C. pa lil	Local	3,532
India	,,	37
Lal	,,	37
Fodea	,,	46
Kindi	,,	44
D.C.	,,	50
Toma	,,	62
Bolo	,,	91
Yarat	,,	24
Bathurst	,,	51
Bis	,,	71
Kanlu	,,	62
G.E.B. 24	Madras, 1931	6,152
Kar	,,	126
Panianala	,,	320
Baitel Fakir	,,	291
Adt 3	,,	48
Co. 5	,,	59
Co. 7	,,	943
Bali	,,	74
Jeeragasamba	,,	13
Jeerasalæ	Madras, 1934	24
Maskathi	,,	21

Variety.	Origin.	Seed in Lb.
Thayalakkaman	Madras, 1934	20
Kavunginpoothala	,,	77
Blue Stick	British Guiana, 1934	7
Kalyaman	,,	9
No. 79	,,	12
D.C.	,,	9
Lead rice	,,	20
Rancajara	,,	11
Garrikassanavari	,,	14

Total : 12,357 lb. 206 bushels.

R. R. GLANVILLE,
Agricultural Officer, Northern Province.

Appendix I.

DISTRIBUTION OF PLANTING MATERIAL, 1934.

	Northern Province.	Southern Province.	Colony.	Njala.
Almond	—	—	—	1
Avocado	5	—	—	48
Banana, Canary (sucker) ...	607	—	2,353	36
Breadfruit	5	—	—	66
Breadnut	—	—	—	6
Brinjal (Solanum) seeds, packets	—	—	—	2
Cacao, seedlings	—	—	—	37
Cacao, pods	—	—	—	17
Cassava, Mayugbe, sticks (bundles)	—	20	—	570
Cassava, Samuya, sticks (bundles)	—	—	—	6
Cassava, Two-Cent, sticks (bundles)	—	20	—	202
Cinnamon	—	—	—	4
Coffee, Robusta, seed, lb. ...	131	30	—	198
„ „ seedlings ...	3,684	4,204	3,463	4,261
„ Stenophylla, seed, lb. ...	—	31	—	31
„ „ seedlings ...	—	312	1,804	325
Coconut, seedlings	37	—	—	—
Coco yam, lb.	25	—	—	—
Cowpea, seeds, lb.	—	5	—	3½
Efwatakala grass, seed, lb. ...	—	—	—	5
Ginger, lb.	—	136	—	50
Grapefruit	16	—	957	—
Ground-nut, Kono, lb. ...	18	35	—	20
Guinea corn	—	—	—	2
Jakfruit, seed, lb.	—	—	—	1
„ seedlings	23	—	—	3
Kola, seedlings	75	—	—	—
Kola, pods	—	—	—	10
Lemon	6	—	205	—
Lime	—	—	9	—
Maize, Plate, lb.	—	—	—	3
„ Other, „	—	61	—	6
Oil-palm, Deli, seed, lb. ...	—	600	—	146
„ „ seedlings ...	215	98	—	100
Oil-palm, Nigerian, seed, lb.	—	600	—	123
„ „ seedlings	1,278	200	90	453
„ Kawei, seed, oz. ...	—	—	—	4
„ Kpolei „ „ ...	—	—	—	3

Appendix I—*continued.*

DISTRIBUTION OF PLANTING MATERIAL, 1934—*continued.*

	Northern Province.	Southern Province.	Colony.	Njala.
Okra	—	—	—	2
Oranges, seedlings	72	—	100	—
Pawpaw seeds, packets ...	20	—	—	4
„ seedlings	—	—	—	23
Pigeon pea, seed, lb.	—	1	—	¾
Pine-apple, Red Spanish ...	—	—	448	—
Plum, Governor	—	—	—	10
Pueraria sp., seeds, lb. ...	—	—	—	135
Rice, D.C. (bushels)	—	38	53	1½
„ Unspecified, upland ...	162	—	15	—
„ „ wetland ...	204	—	—	—
„ Fodea (bushels) ...	—	—	60	—
Rose apple	—	—	—	13
Sapodilla	—	—	—	9
Sour sop	—	—	—	4
Sweet lime	—	—	7	27
Tamarind	—	—	—	1
Tangerine	7	—	74	—
Tea, seed, lb.	—	—	—	5
Yams, Chinese, lb.	430	890	—	284
„ Yellow „	743	1,214	—	615

Appendix Ia.

DISTRIBUTION OF PLANTING MATERIAL, 1934.

Ornamental Plants from Njala Agricultural Station.

Acalypha, cuttings	210
Allamanda, „	60
Angelica, „	910
Aristolochia, seeds, pkt.	3
Asparagus fern	1
Bamboo, cuttings	60
Bauhinia, seeds, pkt.	4
„ plants	12
Bignonia Unguis-cati	63
Bougainvillea, cuttings	135
Caladium, bicolor	2
Canna	12
Cassia auriculata, seeds, pkt.	1
„ simea „ „	2
„ sieberiana „ „	2
„ „ plants	72
Cedrela	3
Clerodendron fallax, seeds, pkt.	1
„ „ plants	17
„ paniculatum	28
Croton, cuttings	120
Dracaena, cuttings	60
Duranta, „	60
Erythrina glauca, cuttings	14
Flamboyante, seeds, pkt.	3
Gliricidia maculata, cuttings	600
Hisbiscus, cuttings	122
Honeysuckle	1
Hydrangea	3
Ipomoea dissecta, seeds, pkt.	2
„ purpurea, „ „	2
„ „ plants	4
Ixora coccinea, cuttings	6
Jasminum grandiflorum	31
Jatropha podagrica, seeds, pkt.	2
Lagerstroemea Flos-reginæ, seeds, pkt.	1
Leucaena glauca	4

Appendix Ia—*continued.*

Moon flower, seeds, pkt.	2
Morning Glory	72
Oleander, cuttings	60
Petrea volubilis, cuttings	1
Phyllanthus	6
Pitanga cherry	307
Pride of Barbados, seed, pkt.	3
Quisqualis, cuttings	24
Red lily (Hippeastrum), bulbs	24
Screw pine	2
Talipot palm	4
Tecoma stans, seeds, pkt.	1
Thrinax argentia, seeds, pkt.	1
„ „ seedlings	1
Thunbergia laurifolia	28
„ erecta, cuttings	50
„ Mysorensis, cuttings	12
Toddy palm	5
Wallichia disticha, seeds, pkt.	1
„ „ cuttings	8

Appendix II.

RAINFALL, 1934.

—	Northern Province.					Southern Province.							Colony.			
	Batkunu.	Kabala	Makeni	Marampa.	Rokupr.	Bonthe.	Jaiama.	Kailahun.	Koyeima.	Moyamba.	Njala.	Segbwema.	Freetown,	Hill Station.	Kissy.	Newton.
January	0·00	0·00	0·00	0·00	—	0·00	0·16	0·00	0·00	0.00	0·00	0·00	0·00	0·00	0·00	00·0
February	0·50	1·14	*	*	—	0·52	0·15	0·90	0·15	0·00	0·15	3·09	0·07	0·00	0·04	0·40
March	0·55	2·26	1·40	3·47	—	*	2·16	16·90	1·94	1·30	3·05	6·36	0·06	0·05	0·02	0·56
April	3·06	1·91	2·26	3·21	—	*	5·75	16·84	6·73	4·78	2·36	3·60	2·09	1·45	2·57	2·40
May	3·71	1·41	4·25	3·99	—	6·01	7·30	14·34	6·05	1·35	3·12	4·87	2·64	1·80	1·66	1·55
June	9·97	12·68	12·29	21·04	10·98	16·25	11·46	26·34	3·32	13·54	21·12	8·67	17·95	14·17	11·86	12·83
July	14·96	12·92	21·36	*	28·47	22·55	13·87	7·69	15·51	20·91	20·06	14·52	53·38	48·71	32·75	23·84
August	22·36	17·43	24·03	*	27·13	32·82	10·96	19·46	10·30	19·43	21·11	11·30	47·63	41·51	32·22	31·75
September	17·90	21·79	22·10	15·93	19·01	19·18	12·94	13·74	29·26	18·62	14·91	10·56	31·81	26·08	22·78	17·62
October	14·81	20·01	19·45	22·01	20·31	19·06	12·45	13·72	8·90	10·02	14·28	16·37	12·67	13·18	11·79	6·42
November	*	1·48	3·92	6.43	3·97	5·52	6·76	4·55	1·41	4·41	3·73	5·19	4·35	4·86	5·74	4·86
December	0·00	0.00	0·00	0·04	0·08	—	0·00	0·01	0·00	—	0·03	0·25	0·27	0·33	0·22	0·07
Total	—	93·03	—	—	—	—	83·96	135·49	83·57	94·42	103·92	84·78	172·96	152·14	121·65	102·30

* No records.

Appendix III.

REVENUE.

	£	s.	d.	£	s.	d.
LICENCES :						
Produce	1,021	10	0			
Fines for contravention of Native Produce Ordinance	56	1	6			
Departmental fines ...	2	0	4			
				1,079	11	10
FEES OF COURT OR OFFICE, ETC. :						
Sales of old stores ...	137	15	5			
Sales, produce	80	19	0			
Sales, Newton Fruit Farm ...	37	18	7			
				256	13	0
Total				£1,336	4	10

	Yield of A.				Yield of B.				Yield of C.				Yield of D.			
	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.
January	25	35	221·3	133·6	35	52	491·7	355·9	1	1	6·8	3·8	—	—	—	—
February ...	37	48	353·1	229·5	51	71	633·6	450·7	2	2	13·3	7·8	—	—	—	—
March	73	109	759·5	466·4	74	102	903·4	635·1	6	7	49·5	32·6	—	—	—	—
April	77	151	1,188·6	737·0	69	125	1,211·3	825·2	7	16	145·5	94·2	1	1	13·5	10·2
May	38	63	556·2	350·2	43	73	579·1	366·8	3	5	40·6	23·9	—	—	—	—
June	34	48	398·5	231·0	41	57	441·7	271·2	5	9	68·3	38·0	—	—	—	—
July	28	30	221·1	121·8	39	52	422·3	273·3	2	3	16·7	7·4	—	—	—	—
August	31	38	253·9	146·8	54	70	507·1	317·4	4	6	32·9	18·9	1	1	8·4	5·7
September ...	36	42	263·0	155·3	41	53	424·4	267·6	4	4	20·3	11·1	—	—	—	—
October	33	42	314·7	172·7	30	35	340·9	231·4	2	2	21·0	12·5	—	—	—	—
November ...	14	15	118·5	74·9	15	17	189·1	130·7	1	1	13·1	7·8	1	1	7·2	4·6
December ...	9	9	73·7	44·1	5	5	46·9	30·9	1	1	9·3	5·6	1	1	10·7	6·4
Total ...	147	630	4,722·1	2,863·3	158	712	6,191·5	4,136·2	15	57	437·3	263·6	1	4	39·8	26·9

Appendix IV—*continued.*

B—NIGERIAN OIL-PALMS, NJALA, 1934.

YIELD OF WHOLE PLANTATION.

	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.
January	61	88 + 20 blind = 108	720	473
February	90	121 + 14 „ = 135	1,000	688
March	153	218 + 2 „ = 220	1,712	1,134
April	154	293 + 2 „ = 295	2,559	1,667
May	84	141 + 9 „ = 150	1,176	741
June	80	114 + 70 „ = 184	908	540
July	69	85 + 3 „ = 88	660	402
August	90	115 + 1 „ = 116	802	489
September	81	99 + 4 „ = 103	708	434
October	65	79 + 3 „ = 82	677	417
November	31	34 + 6 „ = 40	328	218
December	16	16 + 6 „ = 22	141	87
Total	321	1,403 +140 blind = 1,543	11,391	7,290

Appendix IV—*continued.*

C—NIGERIAN OIL-PALMS, NJALA, 1934.

Comparative Yield of Trees in the Plantation.

Yield in Kg. of fruit.		0–5	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	60–65	65–70	70–75	75–80	80–85	Total number of trees in the plot bearing in 1934.
Actual plot figures.	A	10	14	32	26	30	15	6	9	2	—	1	1	—	1	—	—	—	147
	B	5	11	21	32	21	11	18	16	6	5	4	2	3	2	—	—	1	158
	C	3	1	1	4	4	—	—	2	—	—	—	—	—	—	—	—	—	15
	D	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
	Total (Whole Plot)	18	26	54	62	55	27	24	27	8	5	5	3	3	3	—	—	1	321
Percentage of total number of bearing trees in the plot.	A	6·8	9·6	21·8	17·7	20·4	10·2	4·1	6·1	1·4	—	0·7	0·7	—	0·7	—	—	—	
	B	3·2	7·0	13·3	20·3	13·3	7·0	11·4	10·1	3·8	3·2	2·5	1·3	1·9	1·3	—	—	0·6	
	Whole Plantation ...	5·6	8·1	16·8	19·3	17·1	8·4	7·5	8·4	2·5	1·6	1·6	0·9	0·9	0·9	—	—	0·3	

Appendix IV—*continued.*

D—NIGERIAN OIL-PALMS, NJALA, 1934.

COMPARISON OF TOTAL YIELD OF FRUIT OF INDIVIDUAL TREES IN THE PLANTATION FOR THE NINE YEARS, 1926–1934.

Yield in Kg. of Fruit.	0–20	20–40	40–60	60–80	80–100	100–120	120–140	140–160	160–180	180–200	200–220	220–240	240–260	260–280	280–300	300–320	320–340	340–360	360–380	380–400	Total number of trees in the plot bearing.
A ...	5	3	8	8	7	19	22	23	14	17	14	5	1	2	—	—	2	—	—	—	150
B ...	2	4	2	1	4	11	14	14	19	20	17	14	11	4	6	6	2	4	2	2	159
C ...	—	—	—	1	1	1	4	2	—	3	2	—	—	1	—	—	—	—	—	—	15
D ...	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total ...	7	7	10	10	12	31	40	39	33	41	33	19	12	7	6	6	4	4	2	2	325

Nine trees have not yet borne fruit.

Appendix IV—*continued.*

E—NIGERIAN OIL-PALMS, NJALA, 1934.

	Average weight, heads kg.	Average weight fruit per head kg.	Percentage fruit in head.
January— A	6·3	3·6	51
B	9·5	6·5	68
Whole plot	8·2	5·4	66
February— A	7·4	4·8	65
B	8·9	6·3	71
Whole plot	8·3	5·7	69
March— A	7·0	4·3	61
B	8·9	6·2	70
Whole plot	7·9	5·2	66
April— A	7·9	4·9	62
B	9·7	6·6	68
Whole plot	8·7	5·7	65
May— A	8·8	5·6	63
B	7·9	5·0	63
Whole plot	8·3	5·3	63
June— A	8·3	4·8	58
B	7·7	4·8	61
Whole plot	8·0	4·7	59
July— A	7·4	4·1	55
B	8·1	5·3	65
Whole plot	7·8	4·7	61
August— A	6·7	3·9	58
B	7·2	4·5	63
Whole plot	7·0	4·3	61
September—A	6·3	3·7	59
B	8·0	5·0	63
Whole plot	7·2	4·4	61
October— A	7·5	4·1	55
B	9·7	6·6	68
Whole plot	8·6	5·3	62
November—A	7·9	5·0	63
B	11·1	7·7	69
Whole plot	9·6	6·4	66
December— A	8·2	4·9	60
B	9·4	6·2	66
Whole plot	8·8	5·4	62

Appendix IV—*continued.*

F—NIGERIAN OIL-PALMS, NJALA, 1934.

	Average Yield of Fruit per Tree.		Average Yield of Fruit per Acre (at 75 trees).	
	A (Number of trees fruiting, 147)	B (Number of trees fruiting, 158)	A	B
	kg.	kg.	kg.	kg.
January	0·9	2·1	68	159
February ...	1·6	2·9	117	214
March	3·2	4·0	238	301
April	5·0	5·2	376	392
May	2·4	2·3	179	174
June	1·6	1·7	118	129
July	0·8	1·7	62	130
August	1·0	2·0	75	151
September ...	1·1	1·7	79	127
October	1·2	1·5	88	110
November ...	0·5	0·8	38	63
December ...	0·3	0·2	22	14
Whole year ...	19·5	26·2	1,460	1,964

Average yield over all of fruit per fruiting tree, 22·7 kg. (Number of trees fruiting, 321.)

Average yield over all of fruit per acre (at 75 trees) 1,073 kg.

Appendix IV—*continued.*

G—NIGERIAN OIL-PALMS, NJALA, 1934.

MALE AND FEMALE INFLORESCENCES AT ANTHESIS IN DIFFERENT MONTHS.

—	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	337	74	4·6
February ...	267	112	2·4
March	71	60	1·2
April	196	173	1·1
May	204	92	2·2
June	14	29	0·5
July	103	50	2·1
August	82	42	2·0
September ...	261	67	3·9
October	541	166	3·3
November ...	697	161	4·3
December ...	608	76	8·0
Total for the year	3,381	1,102	3·1

Appendix IV—*continued.*

H—KAWEI OIL-PALMS, NJALA, 1934.

(161 trees in their 10th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	26	46 + 0 blind = 46	164·6	106·9	40	96	0·4
February ...	45	91 + 1 „ = 92	275·2	177·3	35	67	0·5
March ...	60	134 + 2 „ = 136	397·9	260·1	63	26	2·4
April ...	97	234 + 2 „ = 236	873·1	557·9	96	56	1·7
May ...	94	205 + 1 „ = 206	766·0	487·2	29	18	1·6
June ...	81	163 + 16 „ = 179	528·4	335·9	6	16	0·4
July ...	45	67 + 1 „ = 68	204·2	123·6	16	1	16·0
August ...	33	53 + 0 „ = 53	124·8	75·9	101	17	5·9
September ...	16	24 + 2 „ = 26	64·4	39·0	338	44	7·7
October ...	15	19 + 0 „ = 19	68·1	41·0	446	139	3·2
November ...	8	14 + 2 „ = 16	54·3	29·2	430	167	2·6
December ...	1	2 + 2 „ = 4	6·1	3·1	232	126	1·8
Total ...	142	1,052 + 29 blind = 1,081	3,527·1	2,237·1	1,832	773	2·4

Average yield of fruit per bearing tree, 15·8 kg.

Appendix IV—*continued.*

J—HENOI OIL-PALMS, NJALA, 1934.

(104 trees, in their 10th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	21	47 + 9 blind = 56	101·8	61·1	3	23	0·1
February ...	34	75 + 8 „ = 83	145·2	88·6	1	17	0·1
March ...	55	159 + 4 „ = 163	330·0	199·6	12	10	1·2
April ...	60	147 + 4 „ = 151	325·0	205·0	21	19	1·1
May ...	56	136 + 8 „ = 144	306·3	187·9	17	24	0·7
June ...	36	83 + 10 „ = 93	199·3	115·1	7	8	0·9
July ...	12	19 + 1 „ = 20	42·0	22·0	5	9	0·6
August ...	7	9 + 2 „ = 11	18·2	11·0	36	40	0·9
September ...	6	11 + 0 „ = 11	39·4	26·3	153	80	1·9
October ...	6	13 + 0 „ = 13	32·9	15·7	225	131	1·7
November ...	8	18 + 6 „ = 24	31·2	16·7	96	172	0·6
December ...	5	8 + 0 „ = 8	17·3	9·9	29	108	0·3
Total ...	89	725 + 52 blind = 777	1,588·6	958·9	605	641	0·9

Average yield of fruit per bearing tree, 10·8 kg.

Appendix IV—*continued.*

K—KPOLEI OIL-PALMS, NJALA, 1934.

(74 trees in their 9th year after planting.)

—	Number of trees from which heads were harvested.	Nnumber of heads harvested		Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	8	18 + 0 blind =	18	98·7	62·3	14	35	0·4
February ...	20	39 + 0 „ =	39	198·6	124·4	7	113	0·1
March ...	43	106 + 0 „ =	106	520·6	350·5	1	10	0·1
April ...	45	105 + 0 „ =	105	635·8	407·8	7	12	0·6
May ...	28	61 + 0 „ =	61	310·6	196·0	6	5	1·2
June ...	25	45 + 9 „ =	54	170·6	100·6	0	7	0·0
July ...	12	19 + 0 „ =	19	89·9	54·7	0	3	0·0
August ...	8	12 + 0 „ =	12	35·2	20·6	5	12	0·4
September ...	6	11 + 0 „ =	11	57·7	37·8	69	26	2·7
October ...	7	13 + 0 „ =	13	95·0	60·3	191	43	4·4
November ...	1	1 + 0 „ =	1	2·5	1·4	258	36	7·2
December ...	1	1 + 0 „ =	1	3·2	2·1	139	21	6·6
Total ...	68	431 + 9 blind =	440	2,218·4	1,418·5	697	323	2·2

Average yield of fruit per bearing tree, 20·9 kg.

Appendix IV—*continued.*

L—ANGOLA OIL-PALMS, NJALA, 1934.

(6 trees in their 8th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	1	2 + 0 blind = 2	5·4	3·3	2	7	0·3
February ...	2	3 + 0 „ = 3	9·4	5·2	6	5	1·2
March ...	5	15 + 0 „ = 15	87·6	55·8	2	5	0·4
April ...	3	7 + 1 „ = 8	40·9	26·9	5	5	1·0
May ...	3	8 + 0 „ = 8	41·3	29·3	6	2	3·0
June ...	3	7 + 4 „ = 11	31·3	21·1	6	1	6·0
July ...	1	2 + 0 „ = 2	14·6	8·7	0	1	0·0
August ...	2	6 + 0 „ = 6	42·8	27·9	2	4	0·5
September ...	2	3 + 0 „ = 3	14·3	8·8	2	6	0·3
October ...	0	0 + 0 „ = 0	0·0	0·0	9	10	0·9
November ...	1	2 + 0 „ = 2	5·6	2·8	13	7	1·9
December ...	1	1 + 0 „ = 1	3·9	2·2	17	0	—
Total ...	6	56 + 5 blind = 61	297·1	192·0	70	53	1·3

Average yield of fruit per bearing tree, 32·0 kg.

Appendix IV—*continued.*

M—NATIVE AND ANGOLA OIL-PALMS, NJALA, 1934.

	Average weight, head, kg.				Average weight, fruit, per head, kg.			
	Kawei.	Henoi.	Kpolei.	Angola.	Kawei.	Henoi.	Kpolei.	Angola.
January ...	3·6	2·2	5·5	2·7	2·3	1·3	3·5	1·6
February ...	3·0	1·9	5·1	3·1	1·9	1·2	3·2	1·7
March ..	3·0	2·1	4·9	5·8	1·9	1·3	3·3	3·7
April ...	3·7	2·2	6·1	5·8	2·4	1·4	3·9	3·8
May ...	3·7	2·3	5·1	5·2	2·4	1·4	3·2	3·7
June ...	3·2	2·4	3·8	4·5	2·1	1·4	2·2	3·0
July ...	3·0	2·2	4·7	7·3	1·8	1·2	2·9	4·3
August ...	2·4	2·0	2·9	7·1	1·4	1·2	1·7	4·6
September	2·7	3·6	5·2	4·5	1·6	2·4	3·4	2·9
October ...	3·6	2·5	7·3	—	2·2	1·2	4·6	—
November	3·9	1·7	2·5	2·8	2·1	0·9	1·4	1·4
December	3·0	2·2	3·2	3·9	1·5	1·2	2·1	2·2
Whole year	3·3	2·2	5·1	5·3	2·1	1·3	3·3	3·4

Appendix IV—*continued.*

N—DELI OIL-PALMS, NJALA, 1934.

(106 trees in their 4th year after planting.)

——	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of good heads harvested, kg.	Weight of fruit kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ..	8	11 + 6 blind = 17	27·2	15·7	41	23	1·8
February ...	17	35 + 18 „ = 53	64·2	40·4	22	5	4·4
March ...	32	59 + 12 „ = 71	149·2	96·3	83	11	7·6
April ...	43	84 + 6 „ = 90	232·9	148·5	93	0	—
May ...	35	58 + 6 „ = 64	177·7	116·3	112	2	56·0
June ...	31	48 + 7 „ = 55	130·5	79·5	24	2	12·0
July ...	8	13 + 5 „ = 18	34·8	20·0	10	2	5·0
August ...	5	6 + 3 „ = 9	24·6	16·0	34	0	—
September ...	3	3 + 3 „ = 6	13·2	7·5	125	7	17·8
October ...	7	8 + 2 „ = 10	24·2	15·0	223	28	8·0
November ...	4	4 + 1 „ = 5	14·5	8·6	312	51	6·1
December ...	1	2 + 1 „ = 3	8·1	4·0	185	45	4·1
Total ...	71	331 + 70 blind = 401	901·1	567·8	1,264	176	7·7

Average yield of fruit per bearing tree, 8·0 kg.